REMARKS/ARGUMENTS

In the Office Action, the Examiner noted that claims 1-23 are pending in the application. The Examiner additionally stated that claims 1-23 are rejected. By this amendment, claims 1-23 have been amended. Hence, claims 1-23 are pending in the application.

Applicant hereby requests further examination and reconsideration of the application, in view of the foregoing amendments.

In the Claims

Rejections Under 35 U.S.C. §102(b)

The Examiner rejected claims 1-23 under 35 U.S.C. 102(b) as being clearly anticipated by Lakshman et al (ACM 1-58113-003, hereinafter "Lakshman). Applicant respectfully traverses the Examiner's rejections.

With regard to claim 1, the Examiner indicated that Lakshman anticipates a first set of rules to the packets by values of the header fields (Lakshman, page 203, col. 2, lines 29-35); and a classification system for selecting specific rules in the set of rules as applicable to a specific packet (Lakshman, p. 203, col. 2, lines 29-35); characterized in that the classification system projects the first set of rules as N-dimensional entities on N axes in N-dimensional space, marking the beginning and ending value on each axis for each rule as a breakpoint, assigns a sequence of binary numbers to each interval between breakpoints such that all adjacent intervals in ascending sequential order; associates a subset of the first set of rules as applicable in each interval to the assigned binary number of the appropriate interval between breakpoints on each axis, then considers a packet as a point in the N-dimensional space according to its header field values, locates the binary number assigned to the interval into which the point projects on each axis by performing a search on each axis for the numbered interval into which the point projects on that axis, thereby determining rules applicable to the packet for that axis, and then determines the specific rules applicable to the packet that apply to the packet on all of the N axes (Lakshman, p. 208, col. 2, lines 10-34; Fig. 4; Examiner's Note: a set of breakpoints constitutes an interval).

In the Examiner's Response to Arguments provided in the instant office action, the Examiner stated that he is under statutory obligation to interpret each claim of Applicant in the broadest reasonable manner. In addition, the Examiner noted that from the specification at page 8, lines 11 and 18, Applicant admits that he is using Rene Descartes' Cartesian coordinate system. The Examiner continues to state emphatically, from his perspective that Lakshman at Fig. 4 assigns a sequence of binary numbers to each interval between breakpoints such that all adjacent intervals are numbered in ascending sequential order as evidenced by the binary notation in the sequential order from 0000 to 1111 related to each interval of breakpoint set. The Examiner concludes that, in the broad perspective of the Applicant's claim, Laksman assigns.

Amended claim 1 is provided on the following page for ease of reference.

1. A system for classifying packets, wherein each packet has N header fields to be used for processing, the system comprising:

a first set of rules associating to the packets by values of the header fields; and

a classification system for selecting specific rules in the set of rules as applicable to a specific packet;

characterized in that the classification system projects the first set of rules as N-dimensional entities on N axes in N-dimensional space, marking the beginning and ending value on each axis for each rule as a breakpoint, assigns one of a sequence of binary interval numbers to each interval between breakpoints such that all adjacent intervals are numbered in ascending sequential binary order and such that each of the binary interval numbers has a number of bits that is less bits than the number of bits for axis values corresponding to the breakpoints, associates a subset of the first set of rules applicable in each interval to the binary interval number of the appropriate interval between breakpoints on each axis, then considers a packet as a point in the N-dimensional space according to its header field values, locates the binary interval number assigned to the interval into which the point projects on each axis by performing a search on each axis for the interval into which the point projects on that axis, thereby determining rules applicable to the packet from the subsets of rules by selecting those rules as applicable to the packet that apply to the packet on all of the N axes.

Applicant respectfully disagrees with the Examiner's rejection of claim 1 for the following reasons. As the Examiner so states, Lakshman assigns at Fig. 4 a sequence of to each interval between breakpoints such that all adjacent intervals are numbered in ascending sequential order as evidenced by the binary notation in the sequential order from 0000 to 1111 related to each interval of breakpoint set. In Lakshman's example, intervals are numbered using the same number of bits as those used for axis values. Applicant's invention, on the other hand as recited in claim 1, assigns one of a sequence

of binary interval numbers to each interval between breakpoints such that all adjacent intervals are numbered in ascending sequential binary order and such that each of the binary interval numbers has a number of bits that is less bits than the number of bits for axis values corresponding to the breakpoints. Lakshman's assignment employs the same number of bits for interval number assignment as that used for axis values. Applicant's invention, in contrast, assigns one of a sequence of binary interval numbers to each interval between breakpoints, . . . , such that each of the binary interval numbers has a number of bits that is less bits than the number of bits for axis values corresponding to the breakpoints. Such assignment is clearly advantageous over the teachings of Lakshman in that fewer bits must be dealt with when performing a search to determine the binary interval into which a packet point projects on an axis. Applicant describes this advantage in the description provided with reference to Fig. 2 on page 12, lines 17-19.

Applicant has searched the teachings of Lakshman and respectfully submits that Lakshman utterly fails to teach, suggest, note, allude to, or even hint that one of a sequence of binary interval numbers is assigned to each interval between breakpoints such that each of the binary interval numbers has a number of bits that is less bits than the number of bits for axis values corresponding to the breakpoints. For these reasons, Applicant respectfully requests that the Examiner withdraw his rejection of claim 1.

With respect to claims 2-11, these claims depend from claim 1 and add further limitations that are neither anticipated nor made obvious by Lakshman. Accordingly, Applicant respectfully requests that the Examiner withdraw his rejections to claims 2-11.

With regard to claim 12, the Examiner noted that Lakshman anticipates projecting the rules as N-dimensional entities on N axes in N-dimensional space; marking the beginning and ending value on each axis for each rule as a breakpoint; assigning a sequence of binary numbers to intervals between breakpoints on each axis such that all adjacent intervals are numbered sequentially in ascending order; identifying those breakpoints at which bits in the interval numbers change; associating a subset of the rules as applicable to the assigned number of each interval on each axis; considering a packet as a point in the N-dimensional space according to values of the header fields for the packet;

determining by search the binary number of the interval on each axis into which the packet point projects; substituting a subset of the rules that apply for each determined interval; and selecting rules as applicable to the packet that associate to the packet on all of the N axes.

Claim 12 is recited below for ease of reference.

12. A method for classifying packets in routing, wherein each packet has N fields to be used in processing in a header, comprising:

projecting the rules as N-dimensional entities on N axes in N-dimensional space;

marking the beginning and ending value on each of the N axes for each rule as a breakpoint;

assigning one of a sequence of binary interval numbers to each interval between breakpoints on the each of the N axes such that all adjacent intervals are numbered sequentially in ascending binary order, wherein each of the binary interval numbers has a number of bits less than the number of bits for axis values corresponding to the breakpoints;

identifying those of the breakpoints at which bits in the binary interval numbers change;

associating a subset of the rules as applicable to the one of the sequence of binary interval numbers for the each interval on each axis;

considering a packet as a point in the N-dimensional space according to the values of the header fields for the packet;

determining by search a particular binary interval number corresponding to a particular interval on each axis into which the packet point projects;

substituting the subset of rules that apply for the particular interval for the each axis; and

selecting those rules as applicable to the packet that associate to the packet on all of the N axes.

Applicant disagrees with the Examiner's arguments used in rejection of claim 12 and notes that, in combination with other elements and limitations, amended claim 12 recites assigning one of a sequence of binary interval numbers to each interval between breakpoints on the each of the N axes such that all adjacent intervals are numbered sequentially in ascending binary order, wherein each of the binary interval numbers has a number of bits less than the number of bits for axis values corresponding to the breakpoints. As argued above with reference to the rejection of claim 1, Applicant notes that Lakshman's assignment of interval numbers employs the same number of bits for interval number as that used for assignment of axis values. Applicant's invention, in contrast, employs an interval assignment technique such that each of the binary interval numbers has a number of bits that is less bits than the number of bits for axis values corresponding to the breakpoints. Such a technique for numbering intervals provides throughput advantages over that scheme taught by Lakshman in that fewer bits must be dealt with when performing a search to determine the binary interval into which a packet point projects on an axis. For these reasons, Applicant respectfully requests that the Examiner withdraw his rejection of claim 12.

With respect to claims 13-22, these claims depend from claim 12 and add further limitations that are neither anticipated nor made obvious by Lakshman. Accordingly, Applicant respectfully requests that the Examiner withdraw his rejections to claims 13-22.

With regard to claim 23, the Examiner stated that Lakshman anticipates conducting a first search on one or more axes and using information from the first search to simplify further searching on remaining axes.

Claim 23 is repeated below for ease of reference.

23. In a system for classifying packets by binary or higher-level searching for intervals into which rules project on axes, a method for simplifying a search, comprising:

projecting the rules as N-dimensional entities on N axes in N-dimensional space;

marking the beginning and ending value on each of the N axes for each rule as a breakpoint;

assigning one of a sequence of binary interval numbers to each interval between breakpoints on the each of the N axes such that all adjacent intervals are numbered sequentially in ascending binary order, wherein each of the binary interval numbers has a number of bits less than the number of bits for axis values corresponding to the breakpoints;

identifying those of the breakpoints at which bits in the binary interval numbers change;

conducting a first search on one or more axes; and

using information from the first search to simplify further searching on remaining axes.

Applicant disagrees with the Examiner's arguments provided in rejection of claim 23 and respectfully asserts that claim 23, among other elements and limitations, recites assigning one of a sequence of binary interval numbers to each interval between breakpoints on the each of the N axes such that all adjacent intervals are numbered sequentially in ascending binary order, wherein each of the binary interval numbers has a number of bits less than the number of bits for axis values corresponding to the breakpoints. As argued above with in traversal of the rejections for independent claims 1 and 12, Applicant's invention provides advantages over the prior art, including Lakshman, in that fewer bits are employed to number intervals for rule mapping that what is required when using simple axis values. By way of example, in the specification, Applicant's assignment of intervals using 3 bits is less that the 5 bits required when using axis values. For these reasons, it is respectfully requested that the rejection of claim 23 be withdrawn.

CONCLUSIONS

In view of the arguments advanced above, Applicant respectfully submits that claims 1-23 are in condition for allowance. Reconsideration of the rejections is requested, and allowance of the claims is solicited.

Applicant earnestly requests that the Examiner contact the undersigned practitioner by telephone if the Examiner has any questions or suggestions concerning this amendment, the application, or allowance of any claims thereof.

EXPRESS MAIL LABEL NUMBER: **EO 002 713 812 US** DATE OF DEPOSIT: **9/24/2004** I hereby certify that this paper is being deposited with the U.S. Postal Service Express Mail Post Office to Addressee Service under 37 C.F.R. §1.10 on the date shown above and is addressed to Mail Stop **PETITION**, Commissioner for Patents, PO Box 1450, Alexandria, VA 22313-1450.

Respectfully submitted,
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